

An exploratory study of the relationship between a blended learning approach to instruction and 5th grade student performance in a Kansas public school district

By

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Submitted to the graduate degree program in Educational Leadership and Policy Studies and the Graduate Faculty of the University of Kansas in partial fulfillment of the requirements for the degree of Doctor of Education.

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Date Defended: January 20, 2016

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Date approved: January 20, 2016

ABSTRACT

This dissertation is a mixed methods study of a mid-sized Kansas school district. It explores the relationship between a blended learning approach to instruction and 5th grade student performance on Measures of Academic Progress (MAP) assessments in reading and mathematics. The objectives were to determine what a blended learning environment looked like, what relationship may exist between fall and spring MAP scores, and what relationships exist between spring MAP scores and time logged in Blackboard, the district Learning Management System. The results indicate that a blended learning environment is one in which teachers are able to spend time working with small groups or one-on-one with students while students are working in pairs or independently with and without technology to further their learning. The results also indicate that a statistically significant relationship exists between fall and spring math and reading MAP scores, and students in blended and non-blended 5th grade classrooms in this district performed at similarly statistically on spring MAP. An interesting and statistically significant relationship was found between increased student log in time in Blackboard and spring math MAP results. A similar relationship was not found between increased log in time in Blackboard and spring reading MAP results for students in blended classrooms in the district. A statistically significant difference was also found between teachers with more blended experience and math MAP student performance in spring. Students of teachers with more blended experience were found to have lower spring math MAP scores. At the same time, students of lower socio-economic status (free and reduced price lunch students) were found to have lower reading MAP scores than their full pay peers in spring. Policy and research implications are included and discussed.

Acknowledgements

I would like to dedicate this dissertation to my wife and children. You are truly my whole world and I know that the time I have spent away from you in completing this degree has not been easy to sacrifice for any of us, but I hope you see this as your accomplishment too as I would have not made it through without each of you. Rochelle, I would like to thank you for your support and dedication to our family as we worked through this. You continued to believe in me and pushed me to believe in myself when I sometimes doubted I could complete this journey.

I would also like to thank Dr. Young-Jin Lee for his guidance through the dissertation process. Special thanks are necessary for the help provided by Dr. DeLuca throughout the program, proposal phase, and at times through the arduous finalities of the dissertation. Dr. White, thank you for also believing in me and for your advice at different points in the process from undergraduate to today. Dr. McEwen, thank you as well for your support and advice.

I am very appreciative of the guidance and support of the rest of the ELPS faculty as well. I hope to continue to do the kind of work that will make you proud.

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Chapter One

Introduction

Historically, public school educators across the United States searched for the best instructional methods and tools, especially in the core subject areas (i.e. language arts, mathematics, science, and history), with the most recent innovation coming in the form of digital technology. From its earliest incarnations, various digital and non-digital technologies conveyed the curricular content from slate and chalk to mimeographs, overhead projectors, digital projectors, and online videos including virtual field trips. Simultaneous to these advances in instructional technology, new instructional methods such as direct instruction, cooperative grouping, and differentiation of process, product and/or content have made their appearance in classrooms as well. The evolution of digital technology tools combined with additional instructional methods has met with varying levels of success for teachers and students.

As computers and online technology advanced, so too have the educational and instructional options for schools, students and parents. One option still in its relative infancy is virtual schools. Virtual schools have become a popular trend that developed primarily in the 2000's and represent a divergence from traditional public schools as students learn in an online rather than face-to-face environment. While virtual schools' popularity has been driven by providers and user demand for those not wanting to enroll in brick and mortar schools, early research suggests students are less successful when enrolled in virtual schools compared to traditional schools, leading some to question their true effectiveness in meeting student needs. Examples of this include experiences similar to those of Lawrence, KS where students enrolled in virtual school posted a 26.3 percent graduation rate while those enrolled in the two brick and

mortar high schools graduated at a rate of 88 and 94 percent respectively (“Lawrence Educators Run Virtual School”, 2014). Cavanaugh’s 2009 review of the research of cyber charter schools which would represent one subset of virtual schools identifies a lack of interaction with others as a potential disadvantage which might impact student performance (Cavanaugh, 2009).

As an alternative to a purely virtual environment, many brick and mortar schools are investigating blended learning as a bridge between an online environment and the more traditional brick and mortar educational experience. It is within this context of educational evolution that blended or hybrid learning has emerged. Blended learning is an example of a change initiative meant to address a perceived lack of educational success for students that neither virtual schools nor brick and mortar schools have been able to address effectively (Horn & Staker, 2011). Horn and Staker (2011) have defined blended learning as “any time a student learns at least in part at a supervised brick-and-mortar location and at least in part through online delivery with some element of student control over time, place, path, and/or pace” (p. 3). This definition encompasses the use of a variety of technological tools as well as instructional methodologies currently employed in most schools.

While some studies have indicated that neither online, nor traditional brick and mortar instruction yield substantial differences in impacting student performance, other studies have demonstrated potential advantages in using “blended” or “hybrid” instructional strategies to improve results for students (Means, Bakia, & Murphy, 2014). One possibly significant reason for this, as alluded to earlier, is that student interaction in a blended learning environment is embedded as students experience both online learning and more traditional instruction in the brick and mortar schools with other students.

In addition to the potential performance and educational advantages for teachers and students, the newly implemented Common Core Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects, now mandate that schools increase and integrate their use of technology in many grade levels K-12 (“Common Core State Standards”, 2010).

Most studies of blended learning to this point have not been focused on student performance and instead have “focused on definitions, models, and the potential of blended learning” (Halverson, Graham, Spring, & Drysdale, 2012). Furthermore, K-12 blended learning research is limited (Halverson et al., 2012; Drysdale, Graham, Spring, & Halverson, 2013). In order to fill this gap in the literature, an empirical study that addresses blended learning in the K-12 environment is warranted.

This exploratory study is designed to address the following research questions:

- *What does blended instruction look like in a 5th grade classroom in this school district?*
- *To what extent do 5th grade students’ MAP¹ scores vary from their entry into 5th grade in the fall to their end of year test in the spring?*
- *To what extent do student test scores vary in relation to the amount of exposure to blended instruction?*

In answering these questions based on Horn and Staker’s definition of blended learning, it is necessary to look at how often students are engaging with online material while also looking at

¹ Northwest Evaluation Association’s Measures of Academic Progress (MAP) assessment which used to assess student growth between fall, winter and spring using an equal-interval vertical scale known as RIT (Rasch Unit) scale allowing school districts to compare student performance to national achievement and growth norms and state standards

their performance on assessments. For the purposes of this study, online engagement was measured by how often students accessed the Blackboard Learning Management System. Comparisons between the type and amount of engagement and their potential relationship to changes in student performance were developed using various statistical methods, including descriptive statistics, t-tests, and linear regressions. With these techniques, I was able to identify relationships that existed between the amount of time spent on Blackboard and changes in student performance while also controlling for other variables that may impact student performance. Further, 5th grade teachers were surveyed to identify their practices in blending instruction. Observations of select 5th grade classes were also used to triangulate data collected from the hours logged on Blackboard and teacher surveys.

This exploratory study analyzes the efforts of one medium-sized Kansas public school district in implementing the “rotation” model of blended learning wherein students rotate between online learning opportunities and more traditional instruction at the 5th grade level. Chapter Two of this study provides a review of the literature surrounding both blended learning research and research on effective strategies for language arts and mathematics instruction as well as the theoretical framework for the study. Chapter Three addresses the methodological tools and processes that were used to collect and analyze the data from the study while Chapters Four and Five focus on the findings, analysis, conclusions, and implications of the study. In summary, this study contributes to the knowledge base of research in the area of K-12 blended learning and specifically in the area of blended learning in an elementary school environment while also aiding and informing policy and practice in the use of blended or hybrid learning at these levels of education.

Chapter Two

Review of the Literature

In order to understand the relevant literature and theories surrounding blended learning theory and implementation, this literature review has been divided into six sections. The first section includes a foundation on the theory of change in institutions. The second section focuses on the relationship between blended learning and instructionally effective practices and tools. Section three addresses the history of blended research, specifically focusing on K-12 blended learning. Section four looks at the models of blended learning as identified in recent research while the fifth section will review studies of the effectiveness of blended learning as compared to traditional and/or virtual education. Section six, the final section of this literature review establishes the research behind the methods selected for this study.

Institutionalism, Population Ecology, and Blended Learning

Tyack and Cuban (1995) established that schools, as bureaucracies, rarely change; however, when change does occur it occurs in ways that do not dramatically impact the “grammar of schooling” such as the presentation of content and the ways schools are organized in subjects and grade levels. As technological innovations have been introduced and utilized, the grammar of schooling has not changed all that significantly. Schools still remain very similar to schools of yesteryear and retain most of the same structures and processes that they did over one hundred years ago.

While Tyack and Cuban would argue that change comes slowly, if it comes at all in bureaucracies such as schools, seminal work in the area of Institutionalism establishes that if change does come, it comes in the form of isomorphism. Isomorphism typically counteracts

change as it actually forces organizations to greater conformity to legitimate forms of organizing and practice. However, when these legitimate conceptions of appropriate structure and practice change in the broader organizational environment, isomorphic forces compel individual organizations to change accordingly. In this fashion, isomorphism fosters homogeneity and stability around new patterns of organizing. Thus, the true source of change is often external, not internal.

In education such dynamics apply not only to brick-and-mortar schools, but also to other forms of schooling such as virtual schools or home schools. While the location of school is different in these environments, the structure of school including grades, subjects, materials and assessments is often very similar. Isomorphic change can be “coercive”, “mimetic”, or “normative” (DiMaggio & Powell, 1983). Change in schools can be seen as a result of any or all of these mechanisms of isomorphism. Coercive isomorphism is based on pressures from governmental entities and other state authorities. Mimetic isomorphism stems from organizations imitating one another in the face of uncertainty regarding means-ends relationships while normative isomorphism has to do with the homogeneity of organizations as a result of professional norms and standardization within occupational groups, which creates pressure among members of the occupation to conform to similar practices and processes in a professionalized field (DiMaggio & Powell, 1983; Meyer & Rowan, 1977).

In terms of technological change, both coercive and mimetic isomorphism could be used to explain the use of technology in brick and mortar schools as they have not only adopted new technology and practices to comply with societal expectations for 21st century learning, but also to compete for students in an environment where every student counts and represents a funding source for the organization (“Common Core State Standards”, 2010; Meyer & Rowan, 1977).

As Waters identified in 2011, many school districts had begun to look at three different options including virtual school, supplemental courses online, and blended learning as ways to compete in the education sector due to declining enrollment (Waters, 2011).

Yet another theory that could apply in the case of blended learning is population ecology which studies how organizations adapt or change. Within the study of population ecology sits niche environments which are created when organizations exploit existing opportunities within larger institutions (Hannan & Freeman, 1977). Virtual schools would fit within the model of a niche market. What often happens in a niche environment is that the larger institution that the niche originated from will come to absorb qualities of the niche market organization. An example of this is the impact of home schools on the admissions processes and selection criteria of institutions of higher learning. As described by Wasley (2007), the home school market has grown and institutes of higher learning have adjusted and created more home school friendly practices regarding admissions procedures and practices for home school applicants. In similar fashion, blended learning has arisen in an environment where virtual schools have been offering online opportunities to students and public schools are now trying to recapture a percentage of students they have been losing to those virtual or home schools (Waters, 2011).

Blended learning integrates these two somewhat opposed theories as it is an adopted approach that has been utilized by competitors (virtual and home schools) of the brick-and-mortar schools, but is beginning to become a part of the “grammar of schools” as demonstrated in a recent online article from ASCD which trumpets Blended Learning as the “new normal” in schools (“Special Report: Blended Learning”, 2014).

Instructional Effectiveness-Supporting a blended learning approach or philosophy

Hattie (2009) presents the research behind various instructional practices and the likelihood that certain practices will positively impact student achievement through his study of over 800 meta-analyses of school-aged children. Of those listed in his book, there are primarily five practices that seem to align with the undergirding principles of blended learning using Horn and Staker's 2011 definition which embraces student control of the pace, path, or process of learning. These five practices include Mastery Learning, Keller's Personalized System of Instruction, Student control over learning, Individual instruction, and Implementations using technologies. While Hattie uses Cohen's d to measure effect size, he also includes a "hinge point" of $d=.40$ as average teacher effect occurs between .20 and .40. Based on his description, an effect size of greater than .40 is included as being in "the zone of desired effects" (Hattie, 2009, p. 15-19).

Mastery Learning involved the teacher controlling the pace of instruction and students mastering the material before moving on. According to Hattie, consistent feedback from the teacher to the students through regular formative assessment is a significant aspect of mastery learning. Additionally, in mastery learning, "learning should be held constant and time should be allowed to vary" (p. 170). These represent many of the same principles involved with blended learning as the online supports provide the opportunity for regular feedback for teachers and students alike. Further, the theory of learning being the constant and time varying is a significant aspect of the design behind the flipped model of blended learning (Picciano, Dziuban, & Graham, 2014). Hattie's meta-analysis found an effect size of .58 for Mastery Learning. Keller's system, as an example of mastery learning which originated in the 1960's, involved students pacing themselves and mastering the content presented to them before moving on. This system embeds student control over the pace of instruction and is therefore consistent with at

least one aspect of the definition of blended learning. According to Hattie's research, Keller's system had an effect size of .53.

Additional studies involving student control over their own learning were also studied by Hattie. However, these studies found a slightly higher effect size on motivation than student learning which was merely .04. Yet other studies looked at individualized instruction which align with the principles of blended learning involving students having the ability to control aspects of their learning. Again however, as consistent with the results of student control, the effect size for individualized instruction was smaller at .23.

A final link between Hattie's research and blended learning approaches is the various meta-analyses of implementations using technologies including computer-assisted instruction, web-based learning, interactive video methods, audio/visual methods, simulations, and programmed instruction. Hattie is careful to note that computer-assisted instruction can encompass all of the other implementations of which effect sizes vary from .20 to .60. He also establishes that many caveats apply to the meta-analysis of computer-assisted instruction to create impacts will provide more favorable outcomes for students including using a diversity of teaching strategies, the necessity of providing pre-training to teachers to use computers as a teaching and learning tool, insuring multiple opportunities for learning using computers ranging from activities like tutoring to drill and practice to simulations and others, student control is better than teacher control of the learning, and the need to maximize peer learning and feedback for students. As blended learning is essentially an implementation of computer-assisted instruction, these caveats would likely apply in blended environments as well to increase results for students. When averaging the effect size across studies in computer-assisted instruction, according to the research, the effect size is .37 overall.

While Hattie's work is more generalized across settings, a few studies have been conducted employing some aspects of computer-assisted instruction specifically in elementary schools in the content areas of math and reading. Slavin and Lake (2008), found that computer-assisted instruction as primarily a supplemental program had a median effect size of .19 across various studies. Slavin, Lake, Davis, and Madden (2011) also conducted a similar study which looked at various ways to improve the performance of struggling readers. Computer-assisted instruction had a weighted mean effect size of .09. These studies in math and reading demonstrate that instructional technology has the potential to impact student performance, perhaps more in mathematics than in language arts.

Blended/Hybrid Learning

An ERIC (2014) search indicates that the Blended Learning literature has grown dramatically over the past 15 years. Of the 1,743 articles found with a search term "blended learning", 765 were published between 2000 and 2009 while 923 have been published since 2010. A search for "hybrid learning" which is often a term used synonymously with "blended learning" yielded similar results and many of the same articles. Further, when searching for "K-12 blended learning" using the same approach, there were 5 peer reviewed articles written in 2010, 9 in 2011, 4 in 2012, 2 in 2013, and 1 thus far in 2014. A similar search for peer reviewed articles using the term "K-12 hybrid learning" found a total of 8 articles, three of which were shared with those found with the K-12 blended search. While other factors could account for this apparent downward trajectory of research of blended in K-12 environments including research studies focusing on other K-12 topics, blended learning research being focused on areas other than K-12, and/or not many schools or districts yet using blended learning at the K-12 level other than those already studied, this search does call into question that perhaps the exploration of K-

12 blended learning may be decreasing as the spike of research articles written on the topic occurred in 2011. Given that not many articles were available through the K-12 search, an expanded search was conducted using the search term “blended learning in schools” and 299 peer reviewed articles were available. After reviewing the abstracts for these articles, only 4 were deemed to be applicable to the study proposed. Due to the paucity of peer reviewed research in the area, studies from the original ERIC searches of “blended learning” and “K-12 blended learning” were incorporated into this literature review as well.

Blended learning has been defined in the literature as some combination of face-to-face instruction and online learning (Picciano & Seaman, 2007; Horn & Staker, 2011; Staker, 2011). While the definition of blended learning is vague, studies have sought to establish more clarity in terms of what blended learning really looks like. Variations in the definition of blended learning include items such as the percentage of time students are instructed online versus face-to-face and how, where, when and by whom the choices are made to determine this percentage (Horn & Staker, 2011; Staker, 2011; Schorr & McGriff, 2011).

Blended learning research on how, where and why blended is being implemented in classrooms is minimal. Much of the focus for blended learning research has been in higher education rather than in K-12 school environments. (Picciano & Seaman, 2007; Drysdale et al., 2013; Halverson et al., 2012). Further, profiles of schools and districts utilizing blended learning are also often of charter or private schools rather than public schools (Staker, 2011; Schorr & McGriff, 2011).

More recent blended learning research has focused on policy development to support teachers. This research has shown that work load, resource supports, as well as other issues are

concerns of teachers as they work to implement a blended learning approach in their classroom environments (Graham, Woodfield, & Harrison, 2013; Wallace & Young, 2010).

Blended models

Research on K-12 blended learning has yielded relative agreement that between four and six different models exist. Horn and Staker initially identified six models of blended learning, but in later work revised it to four including the rotation, flex, a la carte, and enriched virtual models. The rotation model is most applicable to this study, but can be further divided into four sub models including station rotation, lab rotation, flipped classroom, and individual rotation. Each of these sub models has subtle differences which make them unique. For instance, the primary difference between the station and lab rotation is the setting where the rotation occurs. While the station rotation occurs in the classroom, the lab rotation occurs elsewhere in the building. The flipped classroom refers to a situation where online learning may occur away from the brick and mortar environment. Individual rotation models are similar to the station and lab rotation; however, students may not utilize all stations available (Horn & Staker, 2011; Staker & Horn, 2012; Picciano, Dziuban, & Graham, 2014). Of the sub models, the model most similar to those observed in this study is the station rotation model.

Effectiveness research on blended learning environments

Means et al. (2014), in their book summarizing current research in the area of blended learning, conducted a meta-analysis of studies looking at the relationship between blended learning and student outcomes. This analysis sought studies where instruction occurred, in part or whole, online as compared to instruction in face-to-face environments. They ultimately found 99 studies that fit their search criteria and used 45 of those studies. Notably, the average age for

learners in these studies was between 13 and 44. Further, “only five studies with seven independent effect size estimates dealt with K-12 education” (p. 20). This lends credence to the work of Halverson et al. (2012) and Drysdale et al. (2013) as they established that there has been little study of K-12 blended learning while also concluding that empirical studies of blended learning in K-12 environments are even fewer. In using the total pool of the 50 effect sizes from the overall analysis, Means et al. (2014) found that “students in conditions that included significant amounts of learning online performed better than students receiving face-to-face instruction by .20 standard deviations” (p.20). They go on to add that this “online advantage” was only statistically significant in environments employing blended and not purely online techniques. Ultimately, the authors suggest that “on average there is no significant difference between purely online and purely face-to-face learning and that there may be modest advantages to blended learning approaches” (p. 22).

Studies involving meta-analyses can have their limitations, including the possibilities of publication bias, search bias, and selection bias (Cooper, Hedges, & Valentine, 2009). However, the results mentioned in the work of Means et al. add to the base of research looking at the relationship between blended learning and student outcomes.

While few studies exist that look at the relationship between blended learning and student outcomes, Wang and Woodworth (2011) studied the impact of DreamBox Learning, an online supplemental math program, on Kindergarten and First graders mathematical learning as measured by MAP fall (pre) to winter (post) math test scores. Their findings indicated a .14 effect size in overall math scores for students in the DreamBox treatment group and a .16 effect size on the measurement and geometry subtests as compared to the control group which received online literacy instruction instead of the 20-40 minutes of DreamBox supplemental math

instruction. The results indicated no statistical significance in scores on the other subtests in math. Additionally, the fact that the control group had no additional math instruction could be a confounding variable that the authors did not account for in their results. However, the relatively short treatment period of only a few months coupled with a short intervention time, could indicate that with continued treatment over a longer period of time, the results could be even greater. This study is particularly interesting and potentially compelling as it is similar in nature to the current study.

In summary, while some studies exist that look at blended learning or aspects of online learning from an empirical perspective, there are few focused on K-12 environments. Even fewer still are studies exploring blended learning at the elementary school level from an empirical perspective. This study aims to contribute to filling this existing gap in the literature.

Literature supporting methods

Given the limitations of prior studies, the following methods appear to be appropriate for the collection and analysis of data to address these gaps in the literature. The data collected for this study is of a mixed method variety as it was conducted with aspects of both quantitative and qualitative research methodologies (Creswell, 2009; Maxwell, 2013). In terms of quantitative research, this study uses multiple regression analysis to study the relationship between student scores on Measures of Academic Progress (MAP) assessments and exposure to the blended learning environment while accounting for other independent variables such as teacher experience, student socio-economic status, student race, as well as other factors that might impact student performance. Further, simple tables or graphs are used to arrange the data involving univariate, bivariate, or multi-variate analysis (Babbie, 2004). Tables or graphs are

used to display the results of the qualitative survey data collected on teachers reports of how blended works and looks in their classrooms. Further aspects of qualitative research include the observations to describe what blended learning looks like in classrooms across the district of study. These data are then triangulated to increase reliability and validity (Maxwell, 2013).

Chapter Three

Methodology

Research Design and Rationale

This study explored the relationship between fifth grade student exposure to a blended learning environment and their academic performance (MAP score). Additionally, this study sought to observe and describe what blended learning looked like in 5th grade classrooms in a Kansas school district and how teachers self-reported their blended approach to instruction. In order to better understand each of these areas, I used a mixed methods approach. Specifically, I used the concurrent embedded approach of mixed methodology whereby both quantitative and qualitative data were collected in a single phase. The quantitative data served as the primary data source and the qualitative data was “embedded” and integrated with the data collected from the multiple sources (Creswell, 2009).

Yet another aspect of the research design was the case study method as this study focused on the work of one particular school district in implementing a blended learning approach at the elementary school level. Merriam (2009) illustrates the importance of the case study in studying educational innovations such as blended learning. Further, the case study allows the collection of data from multiple sources to fully explore a particular phenomenon (Merriam, 2009). In this case, the implementation of a blended learning approach in 5th grade classrooms was explored.

Data Collection

While quantitative data served as primary data sources for this study, qualitative data sources as described in the concurrent embedded model were used to provide a more holistic perspective

of blended learning in 5th grade classrooms (Creswell, 2009). This data included a semi-structured survey given to the 20 teachers of blended classrooms. Observations of selected classrooms were also be conducted to answer the research question:

- *What does blended instruction look like in a 5th grade classroom?*

In order to gain an understanding of 5th grade teachers perceptions of their blended classrooms a brief questionnaire (see Appendix A) consisting of ten standardized questions, including five open-ended questions, were given to 5th grade blended learning teachers. These questions were constructed to maintain consistency with both Horn and Staker's definition of blended learning and Hattie's research on computer assisted instruction. A fifty percent response rate was desired for return of the survey. Summary data including tables and graphs with comparative numbers were collected and analyzed from the survey to determine the relationship between the definitions of blended learning in the literature and what was reported by teachers implementing the blended learning approach. 8 follow up observations of classrooms using the Blended walkthrough observation form (see Appendix B) were conducted to validate or invalidate these perspectives. This validation process followed Creswell's six-step process of qualitative data analysis and interpretation including organizing and preparing for data analysis, reading through all data, coding, and finally theme or category development (Creswell, 2009).

Limitations

Qualitative limitations include concerns of reliability and validity. In terms of reliability, this study was guided by documents that shape the collection of data through a survey method rather than pure observation. Follow-up observations to triangulate the data and justify the accuracy of the data collected through the questionnaire were conducted. These steps enhance

the reliability of the data gathered as the supporting documents in Appendix A and B serve as a sort of protocol to aid future research. According to Creswell (2009), validity of the study is also enhanced through the triangulation of data sources. Additionally, from both a reliability and validity standpoint, researcher bias could come into play as I studied my own district. As an administrator collecting data on teachers, there are also potential concerns regarding teacher participation in the study from an evaluative standpoint. I addressed this concern by making the questionnaire available online to ensure anonymity of the participant. Furthermore, to enhance both the validity and reliability of this study, those selected for observation were given full disclosure of the aspects of the observation and assured that no identifying information was collected. The data collected was also shared with the participant upon request. Overall, as described earlier, Creswell's six-step process was followed and documented during data analysis and interpretation (Creswell, 2009).

Consistent with the Concurrent Embedded Strategy, quantitative data sources served as the primary source of data. Student MAP scores were collected and analyzed in order to address the research question:

- *To what extent do 5th grade students' MAP scores vary from their entry into 5th grade in the fall to their end of year test in the spring?*

MAP data are collected by the school district two to three times within a single year (fall, winter, and spring) with individual student score changes from the fall to spring forming the basis for comparisons within a single academic year of instruction. MAP data allow comparison of student performance to the normed national grade level pool and also the individual student level. Mean growth targets for the academic year are established for each student based on their

fall MAP RIT score (“MAP Assessments: Our scale and norms”, 2014). Students are then assessed as to whether they met their individual growth target through spring testing. While winter testing is often done to determine if growth is “on target” to meet the year end growth target, whether the student meets the end of year target is determined through the results of spring testing. For these reasons, fall to spring data were collected and analyzed.

Descriptive statistics including the mean and standard deviation have been reported. Dependent t-tests were conducted to determine if a statistically significant difference exists between fall and spring scores for 5th grade students in reading and math for all 5th grade students as well as 5th grade blended and non-blended classrooms. Further, effect size as measured by Hedges’ g was calculated to determine how big or small this difference between fall and spring scores is and as a counter measure for the significance of the dependent t-test comparing fall and spring scores.

The next step in the study looked at the amount of student exposure to a blended learning approach to address the third research question:

- *To what extent do student test scores vary in relation to the amount of exposure to blended instruction?*

Data was collected through Blackboard Learning Management System to determine the amount of time the approximately 389 students in 5th grade blended classes spent on the Blackboard platform. These data were then analyzed in conjunction with any changes observed in student MAP score data from the first analysis to identify relationships that may exist between the two sets of data. Descriptive statistics including mean, median, mode, and standard deviation were reported for these data as well. A multiple regression analysis was conducted using the

dependent variable of spring MAP score and independent variables of student exposure to Blackboard, fall MAP score, student race, teacher experience, student gender, and student socio-economic status. The regression model included the following:

$$Y_{\text{Spring MAP}} = X_1 (-\text{Bbtime-}) + X_2 (-\text{SMAPfall-}) + X_3 (-\text{SR-}) + X_4 (-\text{TE-}) + X_5 (-\text{SG}) + X_6 (-\text{SSES-})$$

In the equation above Y_{Spring} is the student's spring MAP score, X_1 is the amount of time the student spent logged onto Blackboard, X_2 is the student's fall MAP score, X_3 is the student's race, X_4 is the number of years a teacher has been teaching, X_5 is the student's gender, and X_6 is the student's socio-economic status. Variable coding for student race was 1 for white and 0 for non-white while number of years teaching was 0 for one year blending experience and 1 for more than one year blending experience. Student gender was coded as 0 for female and 1 for male while student socio-economic status was coded as 0 for students paying full price for lunch and 1 for students who were on free or reduced lunch.

Through these quantitative data collection techniques, I examined and compared the relationship between potential confounding variables and the outcome variable, the spring MAP score. These data were then combined with qualitative data sources to gather a more global perspective of what these data mean by establishing the context of what is happening in the classrooms of the student population studied through the quantitative measures.

Limitations

Qualitative limitations include concerns of reliability and validity. In terms of reliability, this study was guided by documents that shape the collection of data through a survey method rather than pure observation. Follow-up observations to triangulate the data and justify the

accuracy of the data collected through the questionnaire were conducted. These steps enhance the reliability of the data gathered as the supporting documents in Appendix A and B serve as a sort of protocol to aid future research. According to Creswell (2009), validity of the study is also enhanced through the triangulation of data sources. Additionally, from both a reliability and validity standpoint, researcher bias could come into play as I studied my own district. As an administrator collecting data on teachers, there are also potential concerns regarding teacher participation in the study from an evaluative standpoint. I addressed this concern by making the questionnaire available online to ensure anonymity of the participant. Furthermore, to enhance both the validity and reliability of this study, those selected for observation were given full disclosure of the aspects of the observation and assured that no identifying information was collected. The data collected was also shared with the participant upon request. Overall, as described earlier, Creswell's six-step process was followed and documented during data analysis and interpretation (Creswell, 2009).

Potential threats, both internal and external, exist in any quantitative study (Creswell, 2009). In terms of internal validity, the following potential threats existed in the study proposed: regression and selection. In regard to concerns about regression and selection, students with extreme scores were originally planned to be discarded as part of the experiment. However, in reviewing the data and considering the large sample sizes, the extreme scores were included to capture the entire range of student performance. Only incomplete data sets were excluded from the study, otherwise all student data was considered and included in the various quantitative analyses.

External validity concerns also exist in this study including interaction of history and treatment. The results of this study should not be considered as representative of other situations

and times. The results obtained through this study should only be considered to be applicable to the context and time in which they were collected. Repeated studies need to be conducted at later times and locations in order to provide more validity to the results of this particular study.

Chapter Four

Results

The purpose of this study was to examine the relationship between a blended instructional environment and 5th grade student Measures of Academic Progress (MAP) performance in Reading and Mathematics. In order to examine this relationship, the concurrent embedded approach of mixed methodology was used to gather and analyze both qualitative and quantitative data. This approach is frequently used as a means of improving the validity of non-experimental research in the social sciences (Creswell, 2009). The first research question focused on what blended instruction looks like in a 5th grade classroom. Data were collected through a survey of 5th grade teachers using blended instructional methods and observations of select 5th grade blended classrooms in the school district. The second research question looked at the relationship between student MAP assessment scores (assessments given two to three times per year to determine individual student progress) in the fall and spring and I used statistical t-tests to estimate if a significant relationship exists between fall and spring MAP scores in Reading and Mathematics. The final research question evaluated the relationship between the amount of exposure to a blended approach to instruction and student MAP results in Reading and Mathematics. Multiple regression analysis was utilized to examine the influence of multiple variables on student learning including time logged on Blackboard, fall MAP scores, student race, student gender, and student socio-economic status. This chapter presents the various analyses conducted and results in order to answer the three questions posed in the study.

Research Question 1

What does blended instruction look like in a 5th grade classroom?

Data were collected in two phases to answer the first research question. The first phase involved conducting a survey of the district supported blended teachers' practices and perceptions regarding blended instruction as compared with more traditional instructional methods. In order to conduct the survey, an initial email request to participate in the survey (see Appendix A) was sent to the 20 identified 5th grade district blended teachers. This initial request generated an eight person response. A second request for participation was sent through a second email which generated an additional three participants. A third and final email request was sent resulting in two more participants to the survey for a total of 13 out of 20 possible survey respondents. In analyzing the survey data, I looked at trend data for the questions that could be quantified such as questions 1-3 and 9, and followed Creswell's six-step process for qualitative data analysis for questions 4-8 and 10 (Creswell, 2009, p. 185-190).

Survey data

Overall, responses to the first survey question involving teacher experience included teachers with significant differences (see table 1 below).

Table 1

Distribution of Years of Teaching Experience by Survey Participant

Teacher Experience	Responses
0-4 years	4 (30.8%)
5-9 years	4 (30.8%)
10-14 years	3 (23.1%)
15-19 years	0 (0.0%)
20-24 years	0 (0.0%)
25-29 years	2 (15.4%)
30+ years	0 (0.00%)
Total	13

As shown in Table 1, the sample reflects a range in teacher experience that provides a broad perspective in responses to questions on the survey.

In responding to the second question about blended teaching experience, respondents were mixed with five having one year blended experience and eight having two years. This has an impact on responses to some of the other survey questions as several questions rely on teaching experience and experience blending to gain a perspective of differences between traditional teaching methods and blended methods. The more experience a teacher has with each, perhaps the more reliable the perspective in terms of advantages and disadvantages to the blended method when compared with more traditional teaching approaches.

In looking at question three of the survey which asked about the amount of time students are learning online, the majority of respondents (53.85% or 7 people) reported between 26 and 50%. The next highest percentage was between 76 and 99% of the time which was reported by three people or 23.08% of respondents. Two reported students engaged in online learning between 51 and 75% of the time, while only one reported students blended less than 26% of the time.

Question 4 focused on teacher perceptions of differences in instruction pre-blended to blended. Table 2 demonstrates the teacher responses.

Table 2

Teacher perceptions of differences in instruction pre-blended to blended

Survey	Key words/phrases
1	Skipped
2	Not lecture driven, fully interactive environment

Survey	Key words/phrases
3	Students make more choices of what they want to work on
4	More technology used by me and students, students go through at own pace
5	Students have more choices how lesson delivered/who they work with, students work at own pace
6	Skipped
7	Differentiation easier with programs
8	Differentiate to meet student needs, students self-pace and self-regulate
9	Much more one-on-one time with kids, easier to enrich higher students
10	Students more motivated, thus more engaged, like the ability to choose order of task completion
11	More one-on-one time with kids, more time in preparation, more project-based learning
12	Engagement, interact more one-on-one with students
13	Student choice, differentiation, and engagement at higher levels
Summary	Student choices/differentiation (one-on-one w/ students)

In analyzing the data, a repeated theme in responses was the ability to give choices to students in their learning opportunities. Another theme that developed was that teachers felt they were able to differentiate content to meet students' needs and able to spend more one-on-one time with students.

Question 5 asked respondents to consider the perceived advantages and disadvantages of a blended approach to instruction. Teacher responses are captured in Table 3 below.

Table 3

Perceived advantages and disadvantages of blended instructional approach

Survey	Key words/phrases
1	Engaged, Independent, Ownership of Learning
2	Engaged and challenged, take charge of their learning
3	No increase in grades or skill level yet, more time consuming to blend in 1st year, Increase in Student engagement, kids like choice-home log in

Survey	Key words/phrases
4	Prepare for those who abuse technology privilege, engagement does seem to be higher
5	Students struggle to learn without teacher interaction, lot of trial and error in the beginning, group in middle not overlooked anymore
6	Engagement much higher
7	Students not working, play around on tech, students are more engaged
8	Students more engaged, like collaborating in groups, not enough devices
9	Increased engagement, students not self-motivated can struggle
10	Student more engaged, does take more time to teach them to learn independently and collaboratively, no noticeable increase in student performance yet
11	Student make more choices, take more ownership and teach one another, only on and above grade level does well as lower students need direct instruction
12	Engagement, interact more one-on-one with kids
13	Student ownership of their learning greater, move at own pace, differentiation greater, engagement higher due to tech
Summary	Advantages-student engagement, Disadvantages-students need independent learning skills/self-motivation

After analyzing responses, teachers overwhelmingly reported they felt student engagement increased in their blended classroom. The teachers who cited disadvantages indicated students in blended classrooms sometimes struggled with the independent nature of the blended classroom and some had difficulty with motivation to complete work independently.

Question 6 looked at teachers perceptions of differences between blended and non-blended classrooms. Table 4 shows key words and phrases found in teacher responses to question 6.

Table 4

Differences between blended and non-blended classrooms

Survey	Key words/phrases
1	Skipped

Survey	Key words/phrases
2	Differentiate instruction better, students work in groups better
3	Physical appearance-classroom looks different, tech allows for differentiation
4	More group work, students working in all areas of classroom/can take tech with them
5	More student engagement and interaction among peers-students working together, students responsible for what they achieve
6	Engagement and problem solving improved or increased
7	Differentiate instruction better with tech
8	Hands-on learning and group work
9	More engagement and real problem solvers, created IEP's for all kids with tech
10	Student engagement higher, probably less behavioral concerns
11	Students work independently, in small groups, or with partners without the teacher, project based rather than individual assignments
12	Engagement, more time to interact one-on-one with students
13	Students enjoy choosing their own path, who they work with, where they sit, etc.
Summary	Student engagement/interaction between students (group work, pairs)

After considering key words and phrases used by teachers in their responses, teachers repeatedly identified increased student engagement in blended as compared to non-blended classrooms as well as increased interaction between students working in groups or pairs to complete work.

In looking at Question 7 regarding the online tools used in the classroom, all teachers reported using the Learning Management System, Blackboard (Bb), as part of their online resources. Additionally, all teachers also reported using Web-based tools to do online research and interactive videos to support student learning. Almost 70% or 9 out of 13 teachers reported using online simulations and games during the course of the academic day. Two teachers also mentioned resources such as “frontrowed.com” and “khanacademy.com”.

When reviewing how online tools were used in the classroom in Question 8, several teachers mentioned using Bb for multiple purposes and/or as a “warehouse” of resources. Bb was used for assignments, discussion questions, and access to videos for both initial learning of a

concept or enrichment and remediation. A couple of teachers mentioned flipping lessons with videos that could be accessed at home. Several also mentioned doing research on the web as one way in which the resources were utilized in their classroom. Responses seemed to indicate that these resources are all used to teach or reteach content.

Question 9 asked about student control of online learning. Most teachers indicated that students had the choice of time or when to access online material (approx. 77% or 10 of 13 respondents) and how quickly to move through content (pace) at 84.62% or 11 of 13 respondents. Almost all (12 of 13 respondents) indicated that students had control over place and path indicating that most students would be able to choose to access material at home and which resources to use to direct and enhance their learning.

The last question of the survey, Question 10, asked teachers to share the process they used to find the online material they use for student learning. Question 10 key words and phrases are captured in Table 5 below.

Table 5

Process used by teachers to find online material for instruction

Survey	Key words/phrases-Q10
1	Colleague collab., district supported
2	Online searching, teacher building and district collab.
3	Own online research-time consuming
4	Content folders for students, student make some suggestions
5	Own research-google, other teachers, Teachers pay teachers
6	Colleagues and own research
7	Moby max and front rowed own pace and can be accessed at home
8	Own searching, talk w/ teaching partner, district provided resources
9	Twitter, district LMS, PLN
10	Bb provided by district, trained by district staff on videos

Survey	Key words/phrases-Q10
11	Own searching-Google, 5th grade team
12	Teachers on Special Assignment, twitter, PLN, own searching
13	Skipped
Summary	Colleagues, district provided resources, own research-google, twitter, teachers pay teachers

Themes identified in this question included teachers using their colleagues as sources of information as well as district provided resources and trainings such as how to use Blackboard and how to create and post videos. Many teachers also reported that they searched online through Google or used Twitter or sites such as Teachers pay Teachers to find resources as well.

Overall then, and in answer to the first question posed in this study, blended teachers reported that a blended classroom as compared to a traditional classroom involves more student independence and control of learning through use of online instructional tools such as Blackboard as well as more opportunity for teachers to provide individualized help for students. Teachers consistently reported increased student engagement with this learning approach as compared to a more traditional teaching approach not using online learning to the extent and in the manner they have used it in the blended classroom.

Observation data

Additional data were collected using a structured observation tool (Appendix B). This tool looked at general information such as date, length of observation in terms of time, number of students in the class, and subject as well as what teacher instruction and student activity with or without technology looked like. It also addressed perceived levels of student engagement with and without the teacher through a Likert-type scale. Notes were also collected if the data did not fit neatly into one of the categories specific to the tool. For instance, in situations where the

teacher did direct instruction and whole group instruction, notes were taken to describe what happened, such as the teacher led a brief whole group discussion of the concept, then broke students up into groups and led a small instructional group.

In terms of general data, observations were collected from 8 of the original 20 participants. Purposeful sampling was utilized to get a diverse representation in terms of teachers working in schools with varying student demographics. Observations were conducted between 4/17/15 and 5/4/15 and lasted between 5 and 13 minutes with a mode of 5 minutes (in 3 of 8 classrooms) during a “blended” time which is a time where the teacher planned to blend rather than use the more traditional lecture approach to instruction. Classroom size ranged from 17 to 25. Subjects observed included math, language arts and science with math being the most observed in 6 of 8 classrooms observed. Data analysis included a process similar to that used for the surveys as data was summarized item by item to get a sense of the whole and then categories were created from the overall summary. This data was collected for the purposes of adding to the value of the survey data and to help determine some degree of validity to the survey results. If observations yielded significantly different experiences from those described in the surveys, results from the survey might be in question.

In looking at the observation results, the first two data points collected (see Table 6 below) focused on what teachers and students were doing in the classroom during the observation.

Table 6

Teacher and student activity during observation (Items 1 and 2)

Observation	Q1. Teacher Instruction, No. of student ()	Q2. Student activity, No. of students ()
1	Direct instruction/small group	Working on LMS (2); Working independently, no tech (5); Working in small groups, no tech (10)
2	Direct instruction/small group, (8)	Working on LMS (9); Working independently, no tech (8)
3	Lecture/whole group, (18)	Whole group instruction, tech led
4	Direct instruction/small group, (5)	Working on LMS (10); Working independently, no tech (3); Working in small groups, no tech (5)
5	Cooperative learning groups (student led)	Working on LMS (4); Working independently, no tech (6); Working in small groups, no tech (11)
6	Direct instruction/small group, (4)	Working on LMS (20)
7	Direct instruction/small group, (5)	Working on LMS (2); Working on device, but not LMS (2); Working independently, no tech (7)
8	Direct instruction/small group, (3)	Working on device, but not LMS (2); Working independently, no tech (4); Working in small groups, no tech (12)
Summary	Mode of Direct instruction/small group	Mode of Working on LMS; Working independently, no tech, and Working in small groups, no tech

Summary data indicated that “blended” times had little in the way of direct teacher instruction of the whole group. Instead, teachers would more likely be teaching a small group on a particular skill or concept while other students might be on devices or working on other activities independently or in small groups. Teachers might also be roaming the room and meeting with groups or individuals as needed. Additionally, while not a large percentage of students were identified as being on the LMS, almost all classrooms had students working on the LMS and also had students working independently with no technology, or working in small groups with no technology. This data seems consistent with teachers’ reports on the survey of student use of

online resources and differences in their instruction pre-blended to blended. It also fits the definition of the station rotation model for blended instruction.

The next two observation items (items 3 and 4 of Appendix B) focused on student engagement. Using a Likert-type scale, student engagement was gauged between one-low engagement and four-high engagement. Table 7 below captures the data collected during the observations.

Table 7

Observation results for items 3 and 4

Observation	Q3. Student engagement w/ teacher	Q4. Student engagement w/o teacher
1	3 of 4	3 of 4
2	3 of 4	3 of 4
3	2 of 4	N/A
4	4 of 4	2 of 4
5	4 of 4	4 of 4
6	4 of 4	2 of 4
7	3 of 4	4 of 4
8	3 of 4	3 of 4
Summary	Mode 3 of 4	Mode 3 of 4

Generally, data indicated the majority of students were on task while working with or without the teacher. This seems to validate the perception that student engagement increases in the blended classroom as teachers reported in the survey in responding to advantages of the blended approach to instruction (Q5) and is consistent with the literature supporting a blended approach to instruction. However, some classrooms experienced a decline in student engagement for students not working directly with the teacher according to the data. This observation supports

some teacher concerns cited in the survey that some students struggle with the independent nature of work in the “blended” classroom.

In reviewing the notes taken during the observations, most teachers did not simply move right away into stations. Often, teachers had a whole group time to discuss instructions or to possibly do a mini-lesson on the main concept for the lesson for that day.

To answer the first question of the study, I selected a survey to capture the perceptions of teachers in terms of what a blended learning environment looks like and how it compares to the more traditional model and instructional environment. I supplemented these perceptions with observations to compare the perceptions from the survey to the reality in the classroom. In taking both the survey responses and observation results together, many similarities emerged between teacher perception and classroom reality. Students were on devices or working independently, in pairs, or in small groups. Many observations noted that the teacher was working with individuals or small groups while other students were engaged in activities with or without a computer. In this way, students demonstrated what teachers reported in terms of choice. Students often had choices of how to access the content through online support, directly from the teacher, or by working with peers or alone.

Research Question 2

To what extent do 5th grade students’ MAP scores vary from their entry into 5th grade in the fall to their end of year test in the spring?

Descriptive Statistics

In answering this question, data were collected and descriptive statistics (i.e., n, mean, standard deviation) developed for the student populations (Table 8 below). A total of 736 5th grade student scores were used in Reading, while 734 students had scores calculated in Mathematics. As noted by the mean values, it appears that significant change occurred for students on average from fall to spring with an approximate difference of 6.51 RIT points in reading and 12.16 RIT points in math for all students.

Table 8

Descriptive MAP Statistics (all students)

	Minimum	Maximum	Mean	Median	SD	Count
Math						
Fall	141	288	219.76	219	15.25	734
Spring	163	282	231.92	232	17.85	734
Reading						
Fall	151	243	212.50	214	14.62	736
Spring	154	260	219.01	220	14.66	736

While the data show a significant increase in scores from fall to spring for both the Reading and Math MAP, descriptive statistics do not estimate the statistical significance of these differences. Therefore, two paired t-tests comparing fall and spring scores for all 5th grade students in reading and math were performed. Table 9 and Table 10 below show the results of the t-tests.

Table 9

Results of paired t-test for fall and spring reading MAP scores

	<i>Fall RRIT</i>	<i>Spring RRIT</i>
Mean	212.50	219.01
df	735	
t Stat	-25.87	
P(T<=t) two-tail	< 0.0001	

Table 10

Results of paired t-test for fall and spring math MAP scores

	<i>Fall MRIT</i>	<i>Spring MRIT</i>
Mean	219.76	231.92
df	733	
t Stat	-39.16	
P(T<=t) two-tail	< 0.0001	

In analyzing the results of the t-tests, it is important to look at the p-value. As these are considered, it is evident that the p-value is less than .0001 indicating a statistically significant difference between fall and spring scores in both math and reading for all students at the .05 level. While the t-test indicates that there is a statistically significant difference between fall and spring scores, it does not tell us how much effect there is. In other words, it is possible that we can have a very small, but statistically significant difference between measured variables. Therefore, it is important to compute the effect size of the difference between the two MAP scores. In this study, Hedge's *g* was used to calculate the effect size at the 95% confidence interval to determine the magnitude of the difference between fall and spring 5th grade MAP scores in reading and math. The results of that analysis are reported in tables 11 and 12 below.

Table 11

Effect size for Fall to Spring MAP reading scores

		Lower	Upper
Hedge's g (unbiased)	-0.44	-0.54	-0.34

Table 12

Effect size for Fall to Spring MAP math scores

		Lower	Upper
Hedge's g (unbiased)	-0.73	-0.84	-0.63

As these tables demonstrate, a small effect size of .44 resulted for 5th grade MAP reading scores while a medium effect size of .73 was found for 5th grade MAP scores in mathematics. This means that the magnitude of the statistically significant differences in 5th grade MAP scores from fall to spring is larger in mathematics than in reading.

While these analyses effectively answer the second research question, additional questions of the difference in MAP scores between blended and more traditional, non-blended classrooms must be answered prior to considering the third research questions. In order to answer questions regarding these differences, four sample t-tests assuming unequal variances were conducted for fall and spring MAP scores in reading and math for blended and non-blended classrooms. The results of these tests are reported in tables 13, 14, 15, and 16 below.

Table 13

T-test results assuming unequal variances for Fall Reading MAP scores Blended and Non-blended classrooms

	<i>Blended</i>	<i>Non-blended</i>
Mean	212.75	212.16

	<i>Blended</i>	<i>Non-blended</i>
Observations	426	310
df	672	
t Stat	0.54	
P(T<=t) two-tail	0.59	

In reviewing these results, it is evident that the p-value is greater than .05 indicating that there is not a statistical difference between fall MAP scores in Reading when comparing blended with non-blended classrooms. Table 14 below looks at the relationship between Spring reading MAP scores in blended and non-blended classrooms.

Table 14

T-test results assuming unequal variances for Spring Reading MAP scores Blended and Non-blended classrooms

	<i>Blended</i>	<i>Non-Blended</i>
Mean	219.42	218.44
Observations	426	310
df	662	
t Stat	0.90	
P(T<=t) two-tail	0.37	

Again, the results indicate that the p-value is greater than .05 and thus, there is not a statistically significant difference in spring reading MAP scores of students in blended classrooms and those in more traditional, non-blended classrooms. Overall, when taking the results of both Table 13 and 14 together, it could be said that 5th grade students in blended and non-blended classrooms in this district scored similarly in the fall and spring in terms of average RIT score achieved. Tables 15 and 16 below address questions regarding these same relationships in mathematics.

Table 15

T-test results assuming unequal variances for Fall Math MAP scores Blended and Non-blended classrooms

	<i>Blended</i>	<i>Non-blended</i>
Mean	220.20	219.14
Observations	425	309
df	658	
t Stat	0.93	
P(T<=t) two-tail	0.35	

In analyzing the results of this table, it is again evident that $p > .05$, indicating there is not a statistical difference between fall math MAP scores for students in blended and non-blended classrooms. Table 16 addresses the relationship between spring math MAP scores for blended and non-blended 5th grade students in this district.

Table 16

T-test results assuming unequal variances for Spring Math MAP scores Blended and Non-blended classrooms

	<i>Blended</i>	<i>Non-blended</i>
Mean	232.59	231
Observations	425	309
df	656	
t Stat	1.19	
P(T<=t) two-tail	0.24	

While the results of this analysis show more of a difference in mean scores between students in blended and non-blended classrooms, the p-value of greater than .05 still demonstrates that there is not a statistically significant difference in the Spring MAP math scores for 5th grade students in this district.

Table 17 and 18 below explore the difference between or net change in scores from fall to spring in blended and non-blended classrooms on the Reading and Math MAP assessments.

Table 17

T-test results assuming unequal variances for net change in Blended and Non-blended Reading MAP scores fall to spring

	<i>Blended</i>	<i>Non-Blended</i>
Mean	6.68	6.22
Observations	423	308
df	652	
t Stat	0.91	
P(T<=t) two-tail	0.36	

The results indicate again that while the difference in scores from fall to spring is larger in the blended classroom, a p-value of more than .05 indicates that this difference is not statistically significant. Table 18 examines the same relationship on the Math MAP assessment.

Table 18

T-test results assuming unequal variances for net change in Blended and Non-blended Math MAP scores fall to spring

	<i>Blended</i>	<i>Non-blended</i>
Mean	12.4	11.85

	<i>Blended</i>	<i>Non-blended</i>
Observations	423	308
df	678	
t Stat	0.89	
P(T<=t) two-tail	0.37	

In examining the results, the scores basically mimic those comparing blended and non-blended differences from fall to spring in math. Again, while there was an increased difference in scores from fall to spring in blended as compared to non-blended classrooms, the results are not significant statistically.

Overall, in answering the second question of the study, I chose to use t-tests to compare the means between fall and spring MAP scores for 5th grade students in this district (Tables 9 and 10) to determine if the difference between fall and spring scores is statistically significant. I then calculated the effect size (Tables 11 and 12) to determine the magnitude of the statistical significant which was small to medium for reading and medium to large for math. I then used t-tests to analyze the mean differences between student performance in fall and spring of students in blended and non-blended classrooms. The results, illustrated in tables 13-16, demonstrate that while there is a significant difference between fall and spring MAP scores in math and reading for 5th grade students in this school district, there is not a significant difference between those same scores when looking at students in blended and non-blended classrooms. Tables 17 and 18 sought to explore the net change in scores from fall to spring to see if students in blended and non-blended classrooms realized similar increases in scores from fall to spring or whether that change in score was significantly different in blended and non-blended classrooms. Ultimately, the results indicated no statistical difference in reading and math MAP scores of blended and

non-blended students. When taken altogether, these results demonstrate that students in blended and non-blended classrooms perform similarly in average RIT in fall and spring and when looking at the net change in scores from fall to spring in reading and mathematics.

Considering that, based on these results, students seem to perform similarly in blended and non-blended classrooms, question three of the study looked to determine if a relationship exists between a blended learning approach to instruction and student MAP mathematics and reading scores.

Research Question 3

To what extent do student test scores vary in relation to the amount of exposure to blended instruction?

To examine this question, a multiple regression analysis was run for both math and reading to look at the relationship between the amount of time a student was exposed to a blended learning approach as measured by total time logged in Blackboard and student performance on the MAP assessments along with other variables including fall MAP score, student race/ethnicity as white or non-white, teacher experience blending either one or two years, student gender, and student socio-economic status as either a full pay or free/reduced lunch student. Tables 19 and 20 demonstrate the results from the two analyses.

Table 19

MAP Reading Regression analysis results

	<i>Regression Coefficient</i>	<i>Standard Error</i>	<i>t-value</i>	<i>P-value</i>
Intercept	38.09	5.22	7.29	<.0001

	<i>Regression Coefficient</i>	<i>Standard Error</i>	<i>t-value</i>	<i>P-value</i>
Bb total login (in hrs.)	0.02	0.01	1.55	0.12
Fall RMAP	0.86	0.02	35.95	<.0001
SR/E	-0.34	0.74	-0.47	0.64
TE	-0.28	0.69	-0.41	0.69
Sgender	0.79	0.65	1.22	0.22
SSES	-2.54	0.71	-3.56	0.00

In examining this data $R^2=.80$, $F(6, 403)$, $df=403$, $p<.001$, the results suggest that only Fall MAP and Student Socio-economic status have p-values that can be considered statistically significant at the 99% confidence level. Of those two, fall MAP scores had a positive coefficient while student socio-economic status (those categorized as free/reduced pay lunch) had a negative coefficient. Only Fall MAP can be considered to have a significant positive regression weight, indicating that Spring MAP would be expected to be higher if scores in the fall are higher after controlling for the other variables in the model. Student socio-economic status change had a suppressor effect indicating that free/reduced lunch students would be predicted to have a lower Spring MAP score.

Table 20

Mathematics MAP regression analysis results

	<i>Regression Coefficient</i>	<i>Standard Error</i>	<i>t-value</i>	<i>P-value</i>
Intercept	10.02	6.86	1.46	0.15
Bb total login (in hrs.)	0.07	0.02	3.93	0.00
Fall MMAP	1.01	0.03	33.10	<.0001
SR/E	1.41	0.95	1.48	0.14
TE	-4.07	0.89	-4.58	<.0001
Sgender	0.00	0.83	0.00	1.00
SSES	-0.05	0.93	-0.05	0.96

This analysis with $R^2=.78$, $F(6, 403)$, $df=403$, $p<.001$, resulted in three coefficients that had p-values that were statistically significant at the 99% confidence level including Blackboard total login, fall Math MAP score, and Teacher Experience. Of those variables, both fall Math MAP score and Blackboard login had positive coefficients indicating student with higher fall MAP scores and more time logged in Blackboard would have higher spring MAP scores while those with teachers who have had more experience blending would have students with lower spring MAP scores.

Overall then, in considering the results of these two multiple regression analyses and the applicability to the research question, only the Math MAP regression found a statistically significant relationship between the amount of time a student spent on Blackboard and his/her spring MAP score. These results indicate that in math, for each hour a student logs in Blackboard, his/her spring math MAP RIT score will increase by .07 RIT. However, according to the Reading MAP regression results, time spent on Blackboard has no statistically significant relationship with Spring MAP scores.

Chapter 5

Discussion and Implications

This study explored the relationship between a blended learning approach to instruction and 5th grade student MAP performance in reading and mathematics in a medium-sized Kansas school district. Prior research in blended learning at the elementary school level is minimal. Studies comparing student performance in blended and non-blended environments at the elementary school level are even fewer. Much of the research in this area has been devoted to studies looking at implementation of blended learning as well as definitions of blended learning and what it looks like in various locations of the country at this time. Research on various models of personalized learning and use of technology to support instruction points to the possibility that a blended learning instructional approach may yield improved student performance. This study poses three questions designed to begin to fill the void in research regarding blended learning at the elementary school level:

- 1.) What does blended instruction look like in a 5th grade classroom?
- 2.) To what extent do 5th grade students' MAP scores vary from their entry into 5th grade in the fall to their end of year test in the spring?
- 3.) To what extent do student test scores vary in relation to the amount of exposure to blended instruction?

This chapter will draw conclusions from both the quantitative and qualitative data collected, review limitations of the research, establish potential policy implications for K-12 educators, and address future research possibilities in the area of K-5 blended learning.

Conclusions

In answering the first question of the study, teacher survey responses indicated that blended learning is comprised of more choices for students, more differentiation, and one-on-one time with students. Additionally, teachers felt that student engagement and interaction with peers increased in their blended classroom. These teacher responses matched the observation data collected in the study which found that instruction tended to be more direct instruction of small groups of students while other students in the class worked independently, in pairs, or in small groups with or without technology.

While reporting increased student engagement as an outcome of increased student control and choice in learning, some teachers surveyed cautioned that students who lack independent learning skills can and will struggle with this model. Teachers citing this concern recommended teachers specifically teach those skills necessary to help all students be successful in an environment where students have more independence and options to direct their own learning. Observation data also supported these concerns as engagement was perceived to be higher for students working directly with the teacher in some blended classrooms.

The second question of this study sought to determine if a statistically significant relationship existed between fall and spring MAP scores for all 5th grade students in math and reading. In the event there had been no such relationship, there would be no point in looking at the relationship between scores in blended and non-blended classrooms from fall to spring. In the analyses conducted, it was clear that a statistically significant relationship exists between 5th grade fall and spring MAP scores in math and reading. More analyses were completed to look at the relationship between fall and spring scores in blended and non-blended classrooms. In examining the results, no statistically significant difference existed between scores in blended

and non-blended classrooms. This means, at this time, 5th grade math and reading MAP scores in this district are not statistically different in blended and non-blended classrooms.

As this is a study of intermediate outcomes, it is not necessarily surprising that we would find no difference in student performance between these two groups at this time.

Implementation of blended learning in the district is only in its third year and, at the time of study, it was in its second year. As teachers are getting used to using the blended tools in more effective ways, it is very possible future results could yield improved results in blended learning environments that mirror the increased engagement teachers report seeing in their blended classrooms as opposed to the more traditional model. However, as noted by Hattie (2009), the link between increased student motivation or engagement and improved student performance is not necessarily a given.

Another possible reason that I did not find a change and may not find a significant change in performance between these two groups is the possibility that the more traditional classroom environment is evolving in its usage of technology alongside the blended classroom. In the district studied, many more traditional classrooms have the opportunity to use technological devices in a similar manner to their blended counterparts. It would only be natural for those in non-blended classrooms to hear about and seek the kinds of advantages their colleagues are reporting in their blended classrooms through the integration of the technology devices they do have available to them. While the device ratio and specific tools including computers, monitors, and iPads may differ, the opportunity for online access is still often a possibility in non-blended classrooms. So while they are not technically “blended classrooms” according to the district studied, non-blended classroom teachers may be incorporating blended techniques although perhaps on a more limited basis. Even if teachers in these “non-blended” classrooms are using

the tools on a more limited basis, student performance results may more closely resemble that of “blended” classrooms due to similarity in the instructional approach used. The degree of similarity between blended and non-blended classrooms in this district was not the focus of this study, but could be a factor considered in other studies in the future. The results of the t-tests (tables 17 and 18) demonstrate that the net change in student scores from fall to spring in blended and non-blended classrooms is similar statistically thus lending some potential support to this hypothesis. Future studies could examine the extent to which blended and non-blended classrooms are utilizing blended technology to support learning in the classroom and if significant differences in terms of usage exist in the different environments to further isolate these variables.

The third research question focused on variables that may be involved in increasing student performance in the classroom and if more exposure to a blended learning approach might yield improved student performance. While there was not a statistically significant difference between student performance in blended and non-blended classrooms in the district, it might have been possible that a relationship existed between increased time in a “blended” classroom and student performance on the assessment from fall to spring. As indicated in the qualitative section of the study, teachers reported feeling that blended instruction has advantages over a more traditional instructional approach to instruction which might lead one to believe that those advantages would translate into increased student performance. One of the more important factors in increased performance is student engagement. Many teachers, including teachers in this study, reported increased student engagement in blended classrooms as compared to more traditional classrooms. Therefore, this study looked at the amount of exposure students had to the blended aspect of the environment through time logged on the district Learning Management

System (LMS), Blackboard (Bb). Initial quantitative results from this study showed a statistically significant relationship between increased Blackboard login time and spring math MAP scores, but a similar relationship between Blackboard login time and spring reading MAP scores did not exist.

In addition to the similarities between the results in this study and the work of Slavin and Lake (2008) which indicated perhaps more of a relationship in math than in reading, when examining these results, it is important to understand the context of the district's work in the area of math and reading in the last few years. The district studied has had the same math curricular resource for several years. This curricular resource has been used in blended and non-blended classrooms alike. Online supports available in blended and non-blended classrooms are relatively robust. So, as teachers and district staff created course shells within Blackboard, they used similar resources for core and intervention instruction. Consistency between Blackboard course shells across the district may help explain the relationship between increased time on Blackboard and increased student performance in mathematics.

This same consistency in instructional resources has not been available in the area of reading. In the district studied, core instruction and resources used could look very different in every classroom due to the fact that the district has had no core resource until the 2015-2016 school year. Similarly, content and resources available in blended classrooms through Blackboard could differ significantly therefore negating any potential advantages increased time on Blackboard could have due to inconsistency. While not the focus of the current exploratory study into what relationship exists between increased time on Blackboard and student learning, future studies could examine the online components to blended classrooms and look specifically at how the online resources are used and how they impact student learning. In those studies, an

important factor to consider would be looking at similarities and dissimilarities in online content used by the teacher and accessed by students.

Another variable that had a statistically significant relationship with Math MAP scores in blended classrooms was teacher experience working in a blended instructional environment. However, this relationship was opposite of what may be expected. Essentially the data indicated that students with more experienced blended teachers performed more poorly than their counterparts with less seasoned blended teachers. While initially seeming to be counterintuitive, perhaps teachers with more blended experience experimented more with resources beyond the core resource and, through this lack of fidelity to the resource, lost the advantage that fidelity provides in terms of student performance (Aladjem & Borman, 2006). Future longitudinal studies looking at the relationship between teacher experience blending and increased student scores would increase understanding and add to this area of blended learning research.

A variable that had a significant relationship with MAP reading performance was student socio-economic status. Essentially, students on free and reduced lunch performed more poorly than full pay students. The work of Duncan and Brooks-Gunn (1999) established the relationship between poverty and decreased student performance. Given this research, the results of my study are perhaps not all that surprising. What may be somewhat surprising is that the same relationship was not observed in the math MAP regression analysis. I believe that a couple factors may have contributed to these results including the fact that students who struggle in reading, may not necessarily struggle as much in math. This applies to students of all socio-economic backgrounds and includes special populations of students including ESL and Students with Special needs who can perform well in math when given appropriate accommodations as identified in the work of Kiplinger, Haug, and Abedi (2000). Furthermore, as mentioned earlier,

the district studied lacked a core reading resource throughout the entirety of this study. The lack of a core reading resource would likely mean a lack of similarity in instruction and that lack of consistency could negatively impact student scores. When teachers must create their own supports for students with increased needs, often those free and reduced lunch pay students, instruction may not be as strong in reading due to the lack of a core resource to support the development of plans and supports. However, in mathematics, the district did have a core resource which might have helped to develop plans that would more consistently and adequately support students of all socio-economic backgrounds in this district. As the district has secured a core resource to support reading instruction beginning with the 2015-2016 school year, this hypothesis could possibly be tested in future studies.

Limitations

Limitations for this study primarily exist with the quantitative aspects. One of the most notable limitations is that this study is not longitudinal, it is an intermediate outcomes study. The particular district studied is in year 2 of phased implementation of blended learning. However, for many teachers included in this study, this is year 1 of implementation. With the implementation of any new reform, results may not be seen right away. Furthermore, as Oliver and Stallings (2015) argue, teachers need to be prepared to teach in blended learning environments. They discuss contextual, instructional, and technological components that must be effectively integrated in order to achieve success in the blended environment.

Additional limitations include the fact that the results of this study must be limited to the district studied in its current context and setting. This data is point in time data that cannot be

considered to be representative of performance beyond the time and dates in which it was collected.

Other potentially significant limitations involve the definition of blended learning which involves not only the category or model of blended learning that is under study, but also involves the quantifying of “blended” time between more traditional and virtual educational opportunities. I chose to quantify the virtual aspect by using the total time students were logged on to Blackboard in the areas of Math and Language Arts. There are potentially many other ways to quantify the virtual aspect of a blended classroom, including total time logged into a computer, or more qualitative options such as direct observation. The choice to quantify the virtual variable as total time logged in Blackboard could potentially skew the data. In terms of the model of blended learning, I defined the blended classrooms in the district to be following the rotation model of blending. As there are sub-categories of the rotation model, another observer may want to further categorize work in the classroom, especially as studies look to tie student performance to particular models. However, it is difficult to strictly determine or categorize the work of a teacher as many of the sub-categories (station rotation, flipped classroom, individual rotation, and flex) of the rotation model may be employed in a given day in a classroom, especially at the elementary school level.

These limitations can be addressed in multiple ways. One way to address the first two issues identified is repeated studies. By studying the performance of students in blended learning classrooms in this district across time, results could be compared which would enhance validity. Quantitative studies of other districts employing similar models using similar methods would also benefit the field and address the limitations associated with context specific results.

Furthermore, more in depth study of blended learning classrooms in this district over time could enhance reliability and validity of the qualitative data collected as well. Future studies could also focus on other districts with similar demographics and models of blended learning. These studies could use similar qualitative tools and address similar questions as those posed in this study. Each additional study then would add to the research base established within this study.

Policy Implications

Is blended here to stay? This is probably the first question a district might ask as they consider the investment in technology and professional learning that a blended initiative would require. The answer involves revisiting the work of Tyack and Cuban, DiMaggio and Powell, and Hannan and Freeman. In looking at it from the lens of institutionalism, two perspectives could apply. Tyack and Cuban might say that the march toward more personalized learning will continue as it does not represent a significant departure from current reality with devices being added gradually and utilized in different ways in the classroom over time. They might see this as being the newest in a long line of technological advances that may make the job of the teacher easier, but will not fundamentally alter teaching and learning. From the perspective of DiMaggio and Powell, as discussed briefly in Chapter 2, all three reasons including normative, coercive, and mimetic isomorphism, are likely to influence the growth of blended practices across the K-12 spectrum in public schools. Finally, based on the work of Hannan and Freeman in population ecology, the larger institution of public schools has already and will likely continue to move toward inclusion of more technology to support student learning as it absorbs the practices of niche markets such as virtual schools.

So, with the question of whether it is here to stay answered, perhaps the best question a district can ask is, is it worth it? As many districts across the country are incorporating technology into instruction through one-to-one initiatives or other options such as BYOD (Bring Your Own Device), blended learning offers several models to consider that have the potential to transform student learning. However, without solid research into the impact of a blended learning approach on student learning, the choice to adopt a blended learning approach is akin to gambling. And yet, it has become more and more common and popular for districts to increase their purchase of various technologies as society has demanded technological skills be included as a part of 21st century learning. Furthermore, technology standards are embedded within the College and Career Ready Standards (Common Core). As districts work to implement these standards, they must incorporate technology. While this study does not indicate a significant increase in performance for students in blended classrooms, it also does not indicate a significant decrease in performance. In fact, in general, this study indicates about equal performance for students in blended and non-blended classrooms. In looking at the decision of investing in a blended learning approach, districts might want to consider the fact that they may already have or are going to need to have the technology in the near future. This reality, coupled with teacher perception that student engagement increases with a blended approach to instruction, might make it difficult for a district to pass on the potential opportunities blended learning offers. However, when determining if this is the best option, districts should consider the aspects of professional development that will be needed to support teachers in implementation as also indicated in Hattie's research mentioned earlier (Hattie, 2009). Romrell, Kidder, and Wood (2015) further address this issue in their study involving mobile learning by advocating for districts to utilize the SAMR model as a way to aid teachers in transforming instruction. SAMR (substitution,

augmentation, modification, and redefinition) reflects a continuum of implementing technology from simple substitution through redefinition so that the technology is not merely used as a substitute for other instructional tools and instead is used to go beyond and access learning opportunities that would have not been possible had it not been for the technology available in the classroom thus “redefining” the learning that occurs in the classroom. If blended learning is to realize its potential, instruction truly must meet the definition of blended as the best of traditional and virtual instruction combined.

Future Research

Possibilities for future research are endless. As has been discussed time and time again within this study, studies of blended learning at the K-12 level and more specifically the elementary school level, are minimal. Additionally, studies involving elementary schools have primarily profiled models of blended learning and have not focused on student outcomes. This study is hopefully the beginning of studies looking at the relationship between student learning and a blended approach to instruction. The current study is one involving a district early in the adoption of a blended approach. It represents a kind of pioneer study in exploring particular types of blended approaches and student achievement results. Within that description of the current study are many opportunities for additional studies. Future research could look more in depth at districts using various models and how those models are implemented in districts. Other studies could continue to explore student learning results in those districts and classrooms and compare results in blended classrooms with performance in non-blended classrooms as this study did. An important variable to consider in studies such as these is the teacher factor. The performance of one teacher should be compared against another. Essentially, within and between teacher differences should be considered along with difference among classes as one

class might perform significantly better than another either in fall or spring. Further research could focus on longitudinal studies of these same districts and their results as implementation moves through its different phases in districts. Qualitative studies examining implementation and professional learning associated with these districts utilizing various blended models and approaches in K-5 environments could lead to the discovery of effective practices in blending. This study represents a beginning exploration into what blended instruction can look like in a K-5 educational environment and its potential relationship to student achievement outcomes. There is much more research that can and should be done in this area to support schools and districts in making choices regarding selection and/or continuation of investment in a blended learning approach to instruction.

Appendix A

5th grade blended teacher survey

1. How many years have you been teaching?
☐ 0-4 years
☐ 5-9 years
☐ 10-14 years
☐ 15-19 years
☐ 20-24 years
☐ 25-29 years
☐ 30+ years
2. How many years have you been a district supported blended teacher?
☐ 1 year
☐ 2 years
3. How often would you say a student in your classroom is engaging in online learning? (Please select one)
☐ 1-25% of the time
☐ 26-50% of the time
☐ 51-75% of the time
☐ 76-99% of the time
4. If you previously taught 5th grade in a non-blended classroom, please describe what you see as the most significant differences in your instruction pre-blended to blended in the text box below.

[Type a quote from the document or the summary of an interesting point. You can position the text box anywhere in the document. Use the Drawing Tools tab to change the formatting of the pull quote text box.]

5. If you previously taught in a non-blended environment, please briefly share your thoughts on the advantages and/or disadvantages of blending your instruction as it relates to students (engagement, interaction, performance, etc.)

[Type a quote from the document or the summary of an interesting point. You can position the text box anywhere in the document. Use the Drawing Tools tab to change the formatting of the pull quote text box.]

6. As a blended teacher, what do you see are the most significant differences between what goes on in your classroom and what goes on in your colleagues non-blended classrooms?

[Type a quote from the document or the summary of an interesting point. You can position the text box anywhere in the document. Use the Drawing Tools tab to change the formatting of the pull quote text box.]

7. As a blended teacher, what types of online resources are students using in your classroom?
(Please check all that apply)

☐ Learning Management System (Blackboard)

☐ Web-based learning (online research using references and search tools, etc.)

☐ Interactive Videos (using online videos for teaching and training)

☐ Simulations and games (online models or games involving decision making, role playing, etc.)

☐ Programmed instruction (online step-by-step tutorials)

☐ Other (Please specify): _____

8. Please briefly share how you use the online resources you identified in question 7 in your blended instruction in the text box below.

[Type a quote from the document or the summary of an interesting point. You can position the text box anywhere in the document. Use the Drawing Tools tab to change the formatting of the pull quote text box.]

9. In what ways do students control their online learning? (Please check all that apply).

☐ Time (choice when to access online material)

☐ Place (choice where to access online such as home or school)

☐ Path (choice of which online resources to access)

☐ Pace (choice of how quickly or slowly student moves through online content)

10. Please describe the process you used to find the online tools (as described in your response to question #7) you have used to support your students.

[Type a quote from the document or the summary of an interesting point. You can position the text box anywhere in the document. Use the Drawing Tools tab to change the formatting of the pull quote text box.]

Appendix B

Blended Walkthrough observation form

Date: _____

Time: _____

of students: _____

Subject: _____

1. Teacher instruction (Select one) _____ # of students
__ Lecture/Whole Group instruction
__ Direct Instruction/Small group
__ Cooperative Learning Groups
__ Student led small groups
2. Student activity (select all that apply)
__ Working on LMS (_____ # of students)
__ Working on device, but not LMS (___ # of students)
__ Working independently, no tech (___ # of students)
__ Working in small groups, no tech (___ # of students)
__ Whole group instruction, tech led
3. Students actively engaged with teacher
Few 1____ 2____ 3____ 4____ All
4. Students actively engaged without teacher
Few 1____ 2____ 3____ 4____ All
5. Student technology use (what are students doing on tech?)
__ Watching video/tutorial (___ # of students)
__ Listening to audio/reading material (___ # of students)
__ Guided practice-games, simulations (___ # of students)
__ Completing assignments-discussion board, online independent practice, etc. (___ # of students)

*Adapted from Lawrence Public Schools PD walkthrough tool

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